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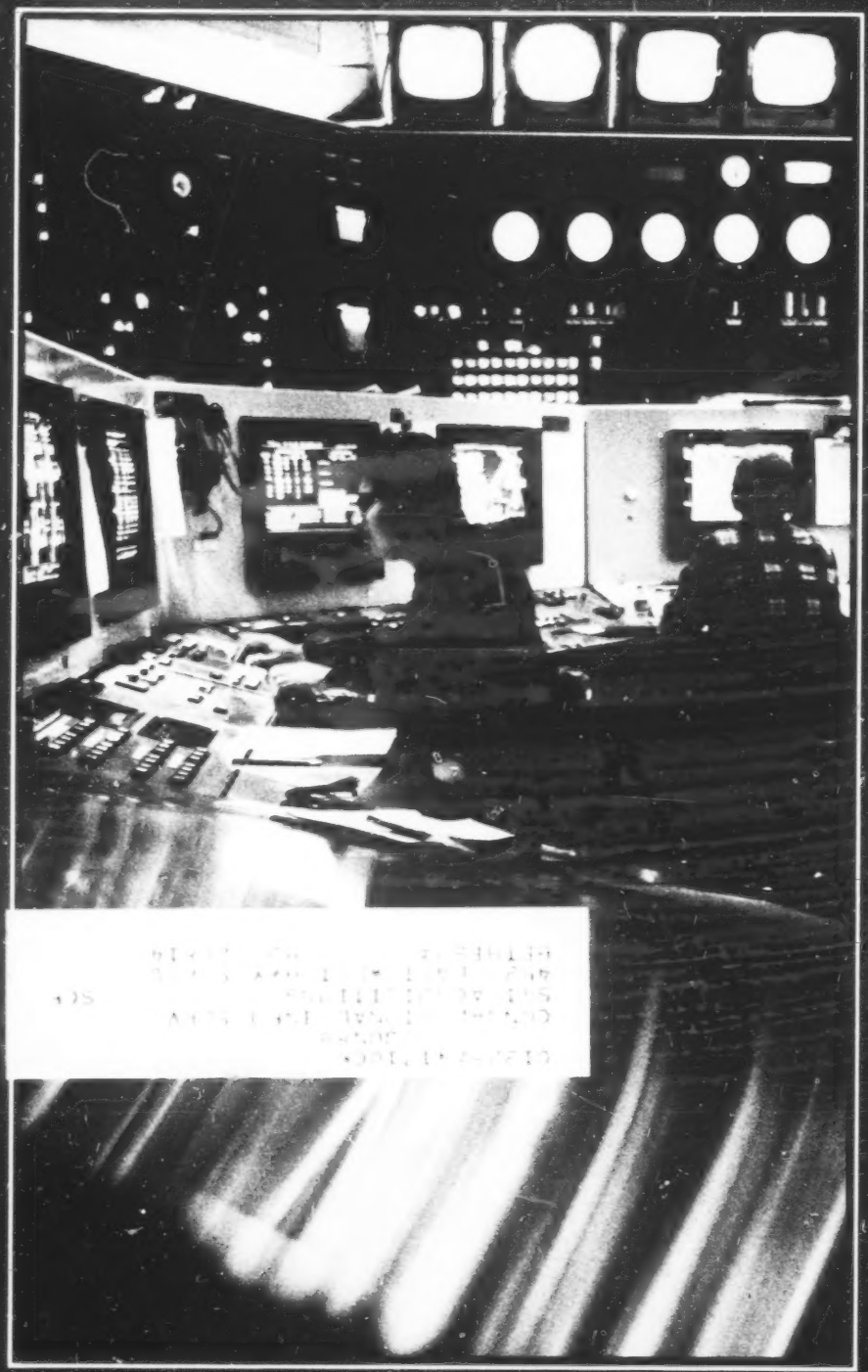

PUTTING TIGHT CONTROL ON STEELMAKING

In Plant Spotlight: Getting More Out of Continuous Casting in Europe

Hot Spot: The Flap Over Steel Trade Restrictions

Technically Speaking: What Four Japanese Companies Are Doing in R&D

AUGUST 20, 1984 VOL. 227, NO. 16

IRON AGE
MANUFACTURING MANAGEMENT

Cover courtesy of Inland Steel

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PUTTING TIGHT CONTROL ON STEELMAKING

With quality and cost pressures mounting, steel companies are pushing hard for better controls. The need for tight control is tending to lead to more automatic systems.

BY GEORGE MCMANUS

"The most economical place to operate is usually on the edge of a cliff," said Richard K. Pitler, senior vice president and technical director, Allegheny Ludlum Steel Corp.

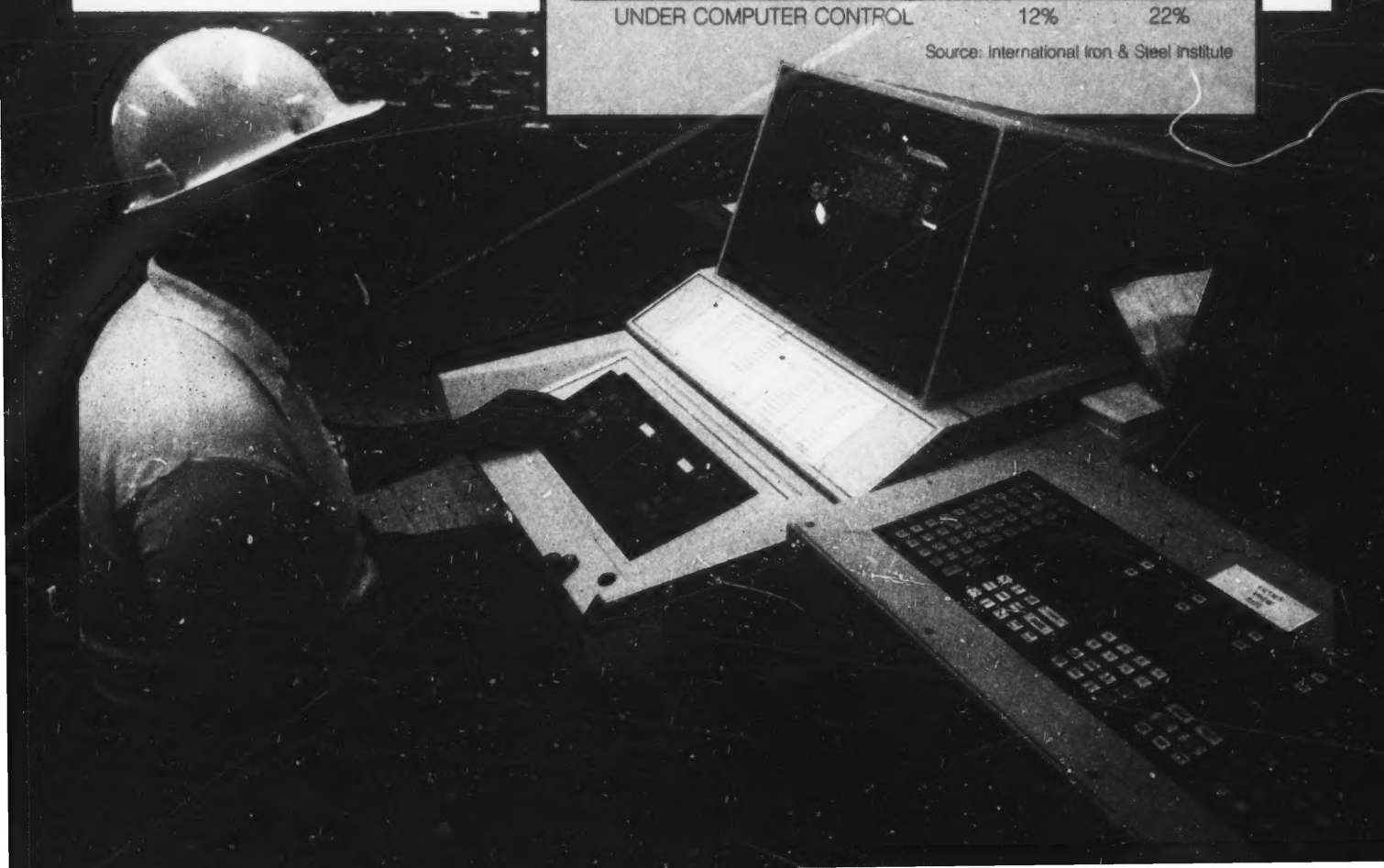
Dr. Pitler was saying that steel costs

Shown here is the entry end and finishing end pulpits at the No. 3 continuous annealing line at Inland Steel.

COMPUTER PROCESS CONTROL GROWTH FACTORS IN SELECTED STEEL PLANT AREAS

	1981	1985
TOTAL HOT STRIP MILLS	**46**	**49**
MILLS WITH COMPUTERS	83%	86%
FURNACES WITH COMPUTERS	46%	78%
TOTAL SLABBING MILLS	**75**	**74**
MILLS WITH COMPUTERS	53%	65%
SOAKING PITS WITH COMPUTERS	44%	60%
TOTAL BLAST FURNACES	**136**	**130**
UNDER COMPUTER CONTROL	53%	71%
STOVE SYSTEMS	35%	59%
TOTAL COKE BATTERIES	**150**	**144**
UNDER COMPUTER CONTROL	12%	22%

Source: International Iron & Steel Institute



are lowest when processes are run very close to the specified limits.

A mill can't afford to go over the cliff by exceeding the limits, he said; but neither can a mill afford to compensate for loose control by providing extra thickness or surplus alloy content.

This helps explain why steel producers are looking for more precise instruments and controls. "The degree of control determines how close you can get to the edge," said Dr. Pitler.

This thinking entered into the installation of a scale on a hot metal crane at the Brackenridge, Pa., plant of Allegheny Ludlum.

"There's a maximum weight you want to handle at AOD," said David L. Burk, director of manufacturing methods at Allegheny Ludlum. If your weighing system has a variance of 10 tons plus or minus, he said, you have to stay that much under maximum.

"If you can control the weight so you're within three tons of the maximum," he said, "your throughput is going to be higher. That's the way we're going with all the parameters we have to control."

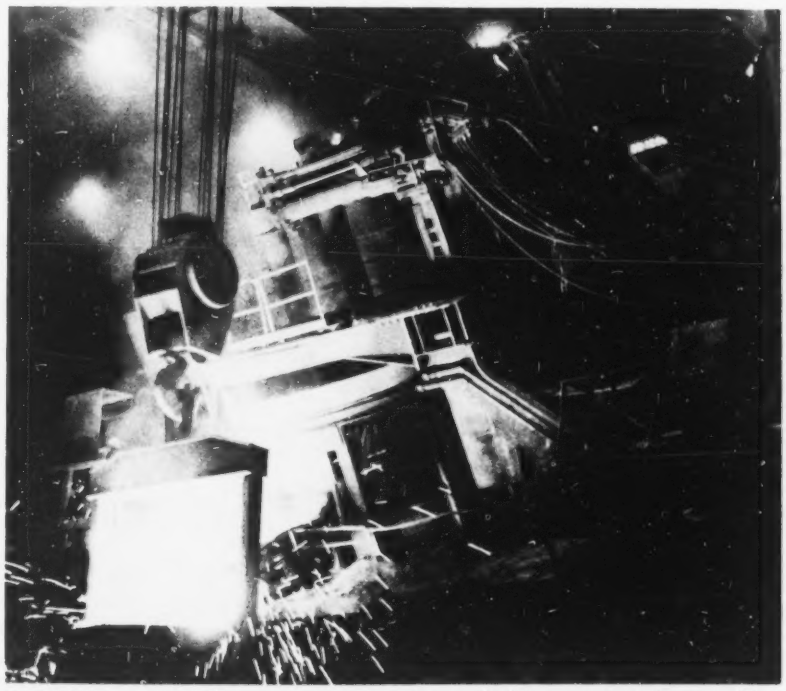
(The ASEA crane scale has a load cell with an error of 0.015 pct. The big benefit of the crane-mounted scale at Brackenridge is it makes weighing fast and more efficient.

The need for tight control is tending to lead toward automatic systems. "A justification for automation is that operators under manual control want to stay far away from the cliff," said Donald J. McMahon, manager of Allegheny Ludlum's process research and development. "As the precision increases, automation will move you closer to the edge."

There is, of course, another big reason for precision. "It's not only the economics," said Mr. Burk. "If you have your process under control, you can make a much more uniform and reliable product."

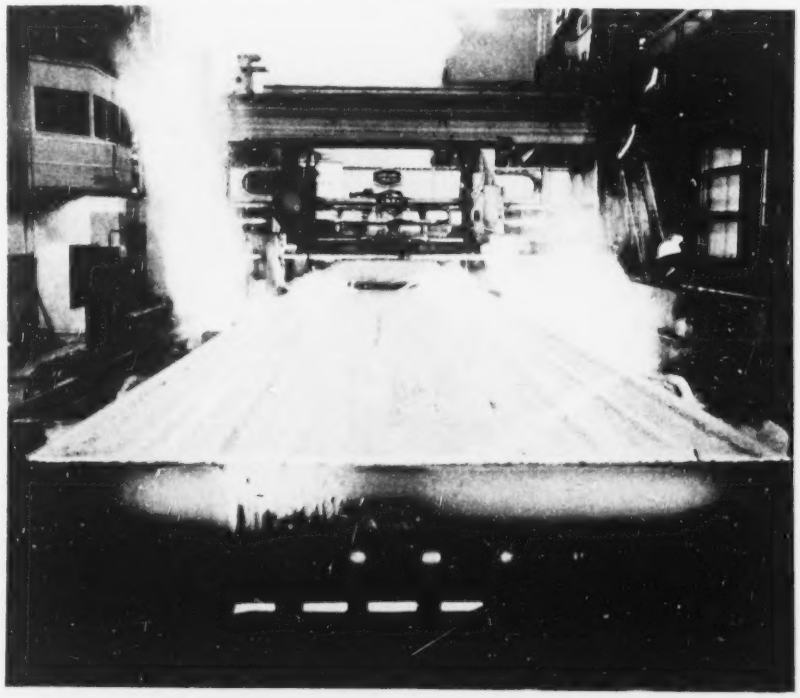
Today's quality standards are such that you can't get by just by playing it safe. "Most people have been overgalvanizing," said Robert Risinger of Scientific Systems Services, Inc. "Not many have control of the process."

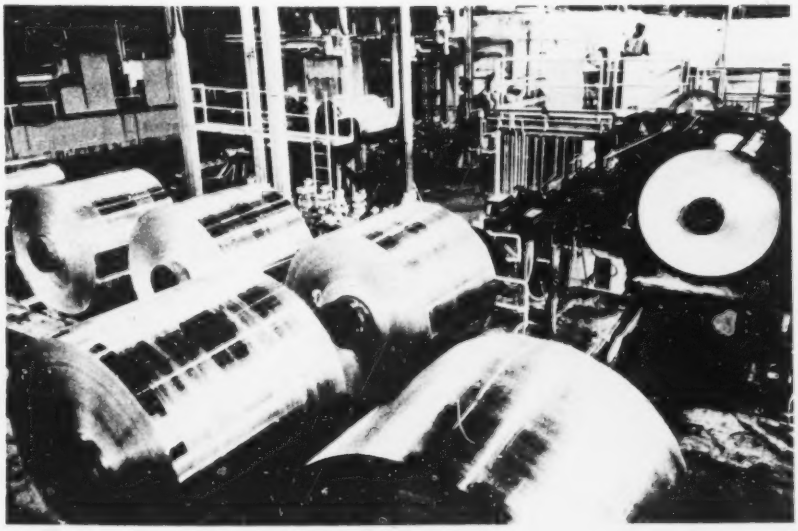
There will have to be control in the future. For measuring zinc coatings,



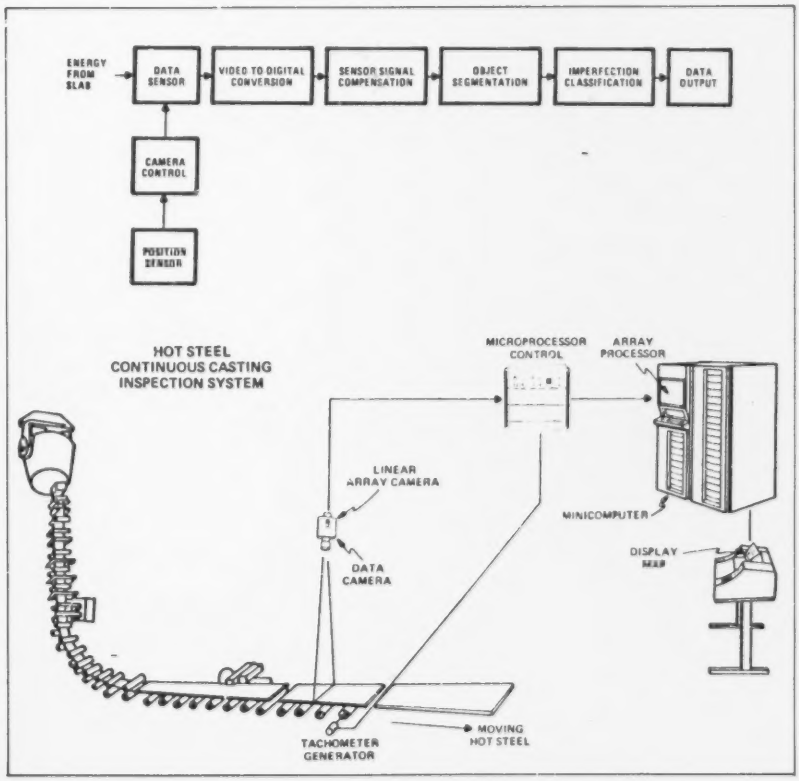
There is no question that computers are going to find increased use in controlling, synchronzing and managing steel plants.

Continuous casting processes like those at the Great Lakes plant of National Steel use control technologies to monitor the quality of the product.





The new No. 7 cold mill at Reynolds Metals' McCook plant electronically measures the width and diameter of alumiunum coil and then feeds information to the computer. Honeywell and U.S. Steel provided the developmental work for the hot inspection of slabs at Gary Works. Below is the functional diagram of the system with the caster's final evaluation system.



General Motors Corp. has gone to what is called the one-spot test. This involves checking the zinc quantity on a smaller sample than had been used before.

Scientific Systems has joined with Hostetler & Decker, Inc., MEA, Inc., and Reliance Electric in a galvanizing system known as AUTOCOAT. This is designed to give closely controlled hot dipped coatings.

With quality and cost pressures mounting, steel companies are pushing hard for better controls. "We will spend $60 million on computers and systems hardware in 1984," said Donald H. Trautlein, chairman of Bethlehem Steel Corp.

"When you add this to our commitment of about 1,000 systems people," said Mr. Trautlein, "we are talking about an investment of well over $100 million a year in this area."

National Steel Corp. expects to spend $15 to $20 million a year on projects that are strictly for process control. "That doesn't include the controls and automation we will have on our new electrogalvanizing line," said James N. Howell, National's engineering vice president.

National's broad strategy calls for a distributed control system. Direct controls will be decentralized but connected to a hierarchial network. This seems to be typical of today's steel systems.

Sheet Mills Shape Up

To assure flatness in sheet products, Bethlehem is installing at Burns Harbor the Vidimon shape meter of the Davy McKee Equipment Corp. This is part of a general rush to shape control.

"We've gotten six orders in the steel industry since last September," said Douglas A. Berg, vice president and general manager of Davy McKee Equipment Corp.

Designed for cold mills, the Vidimon employs a segmented roll to register loads across the width of a strip. Wavy edges or loose centers are corrected by roll bending or by variations in the cooling pattern.

Three of the Davy McKee shape controls are going in at National Steel Corp. and two more at Inland Steel Co. The one at Bethlehem's Burns Harbor plant is unique in that the control will be tied in with an inflatable roll from

The Topography of Strip

"This is a more difficult problem than defining the earth's topography from space," said Walter A. Wilson, supervisor, ASR, at the research center of National Steel Corp.

Dr. Wilson was talking about high-speed inspection of metal strip. He was not speaking in a loose, figurative way; space experts had told him it was easier to pick up small objects from satellites than to inspect the surface of a metal surface traveling at speeds up to 6,000 fpm.

That kind of inspection is being sought in a development program now underway at Westinghouse Electric Corp. The aim is continuous, 100 pct scanning of strip during the cold rolling operation.

"This device is something that has been needed for 20 years or so," said William E. Dennis, manufacturing vice president, American Iron & Steel Institute (AISI).

Past development attempts were unsuccessful but there is optimism now that a cost-effective system can be devised.

Making for optimism is an extraordinary joining of forces. Working through AISI, six steel companies and three aluminum companies are jointly sponsoring the Westinghouse project. Joint research is a fairly new thing for steel companies. Until this newest program, it was unheard of for aluminum and steel companies to cooperate on research.

The new approach reflects a common need for prime surface quality. "The customer has upgraded his requirements," noted Nick L. Brower of Alcoa Labs.

The participants feel joint activity will be more effective than isolated programs. An obvious advantage of the team approach is that it provides more money than an individual company could afford. The nine sponsors of the inspection effort will each contribute around $100,000.

Less obvious benefits are noted by Dr. Dennis. "It brings together very bright people from two industries," he said. "There is good synergism. And if we are successful, it affords Westinghouse a good market opportunity."

The more sponsors for a program, the more sales prospects. This is a real consideration because the limited market for metal sensors has made suppliers reluctant to undertake costly development programs.

For the supplier, there can be another advantage to joint effort. "If you work with individual companies, you get a bewildering set of requirements," pointed out George F.Mechlin, vice president, Westinghouse Research and Development.

All these factors have brought a broad program of joint research in steel. AISI has launched some 15 projects, including four for advanced sensing devices. A further broadening has drawn aluminum companies into the inspection research.

"You've got to view this as a milestone," said Dr. Dennis, who has been a driving force behind the joint activity of AISI.

Another big step is expected to be the participation of aluminum companies and General Motors Corp. in the hot metal sensor program at Los Alamos National Laboratory.

None of which means the Westinghouse strip inspection program is assured of success. In the harsh environment of a rolling mill, the inspection device must collect a vast amount of information and distinguish between significant flaws and such harmless things as drops of water or oil.

This must be done on a real time basis. "It's a process control tool," Mr.Dennis added. The device is expected to permit preventive and corrective action rather than just after-the-fact inspection.

Both the steel and aluminum people emphasize that they are providing good surface quality now. However, this entails rejection of a certain percentage of off-grade sheet. The new device should lower costs by increasing yields.

The device may also help to break down the barrier that now separates space age research from industrial application.

One of the great puzzles and frustrations, Dr. Dennis indicated, is that the U.S. dominates the Nobel prize competition yet lags in the use of advanced technology.

One form of space technology will be tried in the trip inspection system. "The thing that makes you optimistic is the tremendous advance in computer pattern recognition," said Dr. Mechlin.

This technique, which is used to enhance photos of planets, will permit the classification of surface conditions.

"In phase one," read the official announcement, "Westinghouse will investigate the use of variable optical illumination with multiple detection, followed by high-speed thresholding and data collection circuits which will feed a computerized defect classification."

This mouthful is boiled down by Thomas F. Porter, project manager for Westinghouse.

From the volume of information being transmitted by the optical scanner, reported Dr. Porter, the system will attempt to single out areas of probable imperfection. These will be subjected to rigorous recognition analysis.

Phase One of the program will be limited to investigation. Subsequent phases are expected to move through the test and prototype stages.

Participants are Armco, Inc.; LTV Steel Corp.; Cyclops Corp.; Bethlehem Steel Corp.; Inland Steel Co. and National Steel Corp. The aluminum sponsors are Alcoa, Kaiser Aluminum & Chemical Corp., and Reynolds Metals Co. □

Blaw-Knox.

"To our knowledge, that will be the first closed-loop, variable crown system for steel in the world," said Mr. Berg.

Bethlehem has a broad program of flatness control. "We'll probably put in a shape gage at Sparrows Point," said Roger L. Whiteley, vice president, production technology.

Inland is pleased with early results from its Davy McKee shape system. "It's really working very well," said Lionel Cartright, superintendent of process automation for Inland. "Right now, we're monitoring the profile. Within the next week or so, we're going on control."

Inland, is one of a number of mills that are going to hydraulic roll positioning. A hydraulic force system from E.W. Bliss Co. is going on a four-strand mill at Inland. Bliss supplied a hydraulic system to LTV Steel and is building a unit for Rouge Steel.

U.S. mills have been slow in going to hydraulic actuation, but the operating advantages seem to be bringing greater acceptance. Bliss officials point out that hydraulic systems are fifty times faster than electro-mechanical systems.

The first shape control system in the U.S. was installed at the Warren, Ohio, plant of LTV Steel Corp. Used on a four-strand cold mill, this is an ASEA Stressometer flatness control system.

"It's working well," said Ronald Miner, senior manager of research for LTV. Experience has been good "even just by observation, independent of the closed loop control."

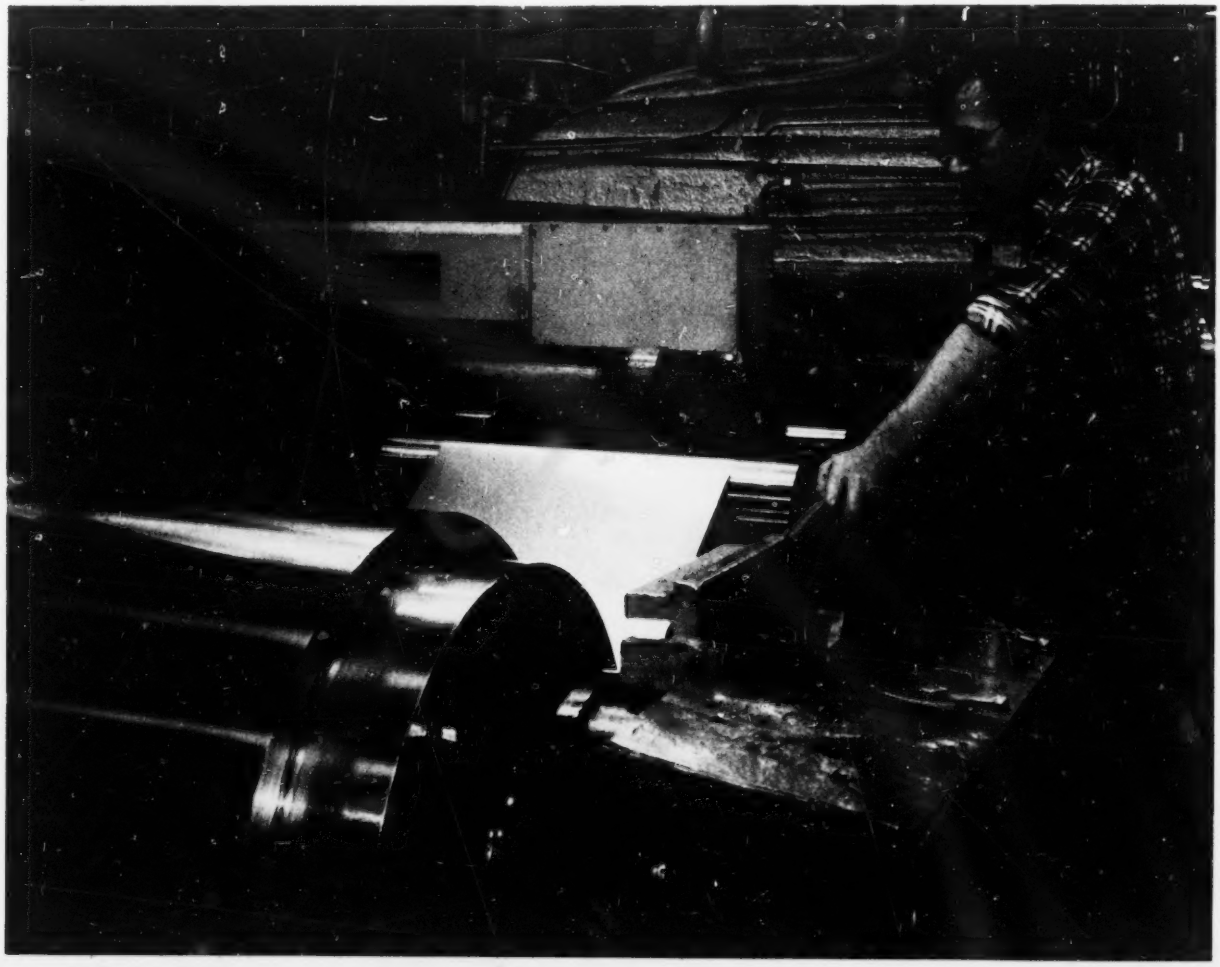
The closed loop system at Warren is tied into roll bending. The mill has not been equipped with distributed cooling.

Flatness controls for both aluminum and steel have been widely used abroad. A wholesale conversion to these controls is now underway in the U.S.

"It's where automatic gage control was 10 years ago," said Ian Russell of ASEA. "We have seven or eight active inquiries."

In both the auto and electrical markets, there are specific demands for good shape," said Mr. Miner. In all

Companies like Accuray Corp., offer systems to measure the thicknesses of steel and other metals. Shown here is the company's 7000 Micro System.



markets, there is general consciousness of quality, he said.

In the U.S. and abroad, the use of shape systems has been confined almost entirely to cold mills. Everyone says this is doing things backwards.

"Dimensional consistency starts at the hot mill," said Mr. Howell of National Steel. "We've got to do some things at the hot mill to provide that consistency."

These things weren't done in the past because it's difficult to make precise measurements of red hot strip traveling at more than 3,000fpm. Now, there is work in this area.

Davy McKee is offering for hot mills something called the Tensometer Shapemeter. Developed at Hoesch in West Germany, the system employs a series of rotors on a lever. The assembly is mounted in place of a looper between the last and next to last stands.

A different approach to hot mill shape control uses non-contact measurement. At Burns Harbor, Bethlehem plans to use three Optocator probes for monitoring shape on the hot mill.

"The Opticator is a distance measuring device," said David R. Wiese, director of engineering, Selective Engineering, Inc., (Selcom) of Valdese, N. C.

Bethlehem's installation will probably be the first attempt to flatness monitoring on a hot mill in the U.S. The decision to tackle this tough job reflects a new spirit in the domestic industry.

"They seem to be willing to spend money just to learn," said Mr. Wiese.

Allegheny Ludlum, which has a number of Optacator units, is working on flatness, but no details have been released. Other Optacators have been delivered to Kaiser Aluminum and Chemical (for gaging hot slabs) and to Edgewater Steel Corp. for final inspection of forged wheels.

A novel application of Optacators is in a system built by Contraves-Goerz. This is designed to measure the wall thickness of tubular products. Readings are taken while the steel is still hot and take only 30 seconds.

"It's a non-contacting gage," said Robert S. Moschetti, sales manager, industrial control systems, Contraves Goerz. "It can measure pipe hot. It's fast."

Not to be confused with the work on shape is the new push to improve the profile of strip. Shape is a function tension variations across the width of strip. Profile involves thickness variations across width.

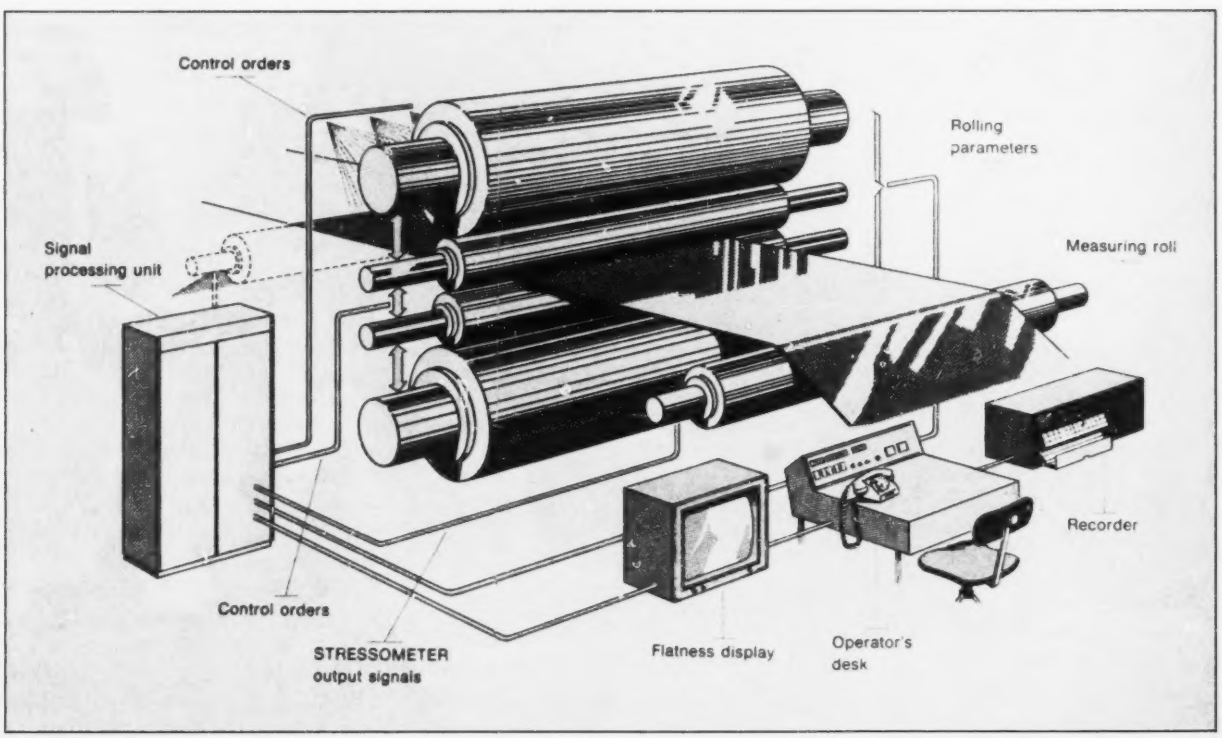
Hot mills and cold mills have long been equipped with sensors and controls that attempt to maintain constant thickness along the length of strip. AccuRay Corp. and Weston Controls are among the leading suppliers of gage sensors. There has been a steady upgrading of the speed and precision of gage controls.

Now being explored is the feasibility of getting constant gage across the width of the strip. If a perfectly regular profile could be maintained at the hot mill, it would have direct quality benefits and it would go a long way towards eliminating flatness problems.

"We've seen a push at the hot mill," said S. J. Outhwaite, manager of gage products for Weston.

At the moment, operators are just

An ASEA Stressometer at Republic Steel's Warren plant adjusts roll pressure to insure uniformly flat sheet.



trying to get a good picture of thickness. "By monitoring his profile, he gets an idea how healthy his strip mill is," said Mr. Outhwaite.

It's expected that data will eventually be fed back into corrective systems.

Direct Sensing

Steel producers are groping for the ideal mix of computer and physical control device. Dr. Pitler feels the sophistication of the computer system should be partly governed by the quality of the information available.

"It depends on how good your sensors are," he said. "If you've got a 79¢ phonograph record, you're not going to play it on a $2,000 hi-fi set."

A similar comment comes from Mr. Howell of National Steel. "Process control is great, but if you don't have a sensor to sense that key element, what's a computer going to do for you?"

For this reason, the American Iron & Steel Institute (AISI) has launched a joint research program aimed at developing some badly needed sensing devices. (See Box).

"No amount of numbers crunching will substitute for sensors," said William Dennis, manufacturing vice president of AISI and a key man in the joint program.

The reverse may sometimes be true. "If you had continuous sensing of the parameters you wanted to measure, you would not need any computation," said Dr. Pitler.

"You would like to have continuous hot metal sensor," he said. "You would like a continuous temperature sensor."

One of the AISI programs is directed at finding a hot metal sensor. Important progress has already been made in this area. Bethlehem Steel and Japan's steel companies have developed dynamic controls for oxygen steelmaking.

A fairly ingenious temperature system is being used by LTV Steel in reheat furnaces at Indiana Harbor and Cleveland.

"The difficulty in measuring temperature in a reheat furnace is that you have a lot of radiation bouncing around," explained Mr. Miner. "This can be bouncing off the surface of the steel but it really doesn't reflect steel temperature.

"What you need is characterize that reflected radiation and differentiate it from the steel temperature."

Researchers at what had been Jones & Laughlin came up with a two-pyrometer system which makes this separation.

From the Republic side of the merger came a device that gives on-line measurement of weld quality in pipe. Republic also contributed the on-line flatness control at Warren.

Honeywell's TDC 3000 is the company's new offering for controlling the steelmaking operation in the industry.

At Raritan River Steel Co., a billet reheat furnace has been equipped with controls from Davy McKee. Called Thermod, the control system is reportedly boosting furnace output and reducing fuel consumptions. Fuel savings of 5 to 7 pct were reported in June and when broken in, the system was expected to reduce fuel use 10 to 15 pct.

As this suggests, the reheating operation is getting considerable attention. Slab furnaces consume more than two million BTU a ton. What steel men would really like is to bypass the reheating operation partially or completely.

The difficulty is that slabs must be allowed to cool for inspection and conditioning. As a way around this, a hot inspection system is being sought.

U.S. Steel and Honeywell worked on an inspection system that employed a linear array camera to map slab surfaces. Results were encouraging and Honeywell is now conducting a Department of Energy study to find the optimum site for a two-sided inspection system.

"We think it's primarily an engineering job," said Donald E. Waters, program manager for Honeywell. He was referring to the advance from one-side to two-sided inspection. "We hope to firm it up in the next six months."

In a technical report last year, the commercial timetable was discussed by S.B. Prellwitz, consulting systems engineer for U.S. Steel.

Individual companies are working on hot slab inspection. "We have a very active program," said Mr. Howell of National Steel.

Inland also has a program. "The other thing we're doing," said Mr. Cartwright, "is installing a home-grown television monitor to look at the bottom of slabs."

Others are looking and hoping. "An inspection device would have great value," said Mr. Whiteley of Bethlehem.

Some steel men fear that a successful scanner would also have great cost. The cost factor keeps cropping up as steel people try to avail themselves of space age technology.

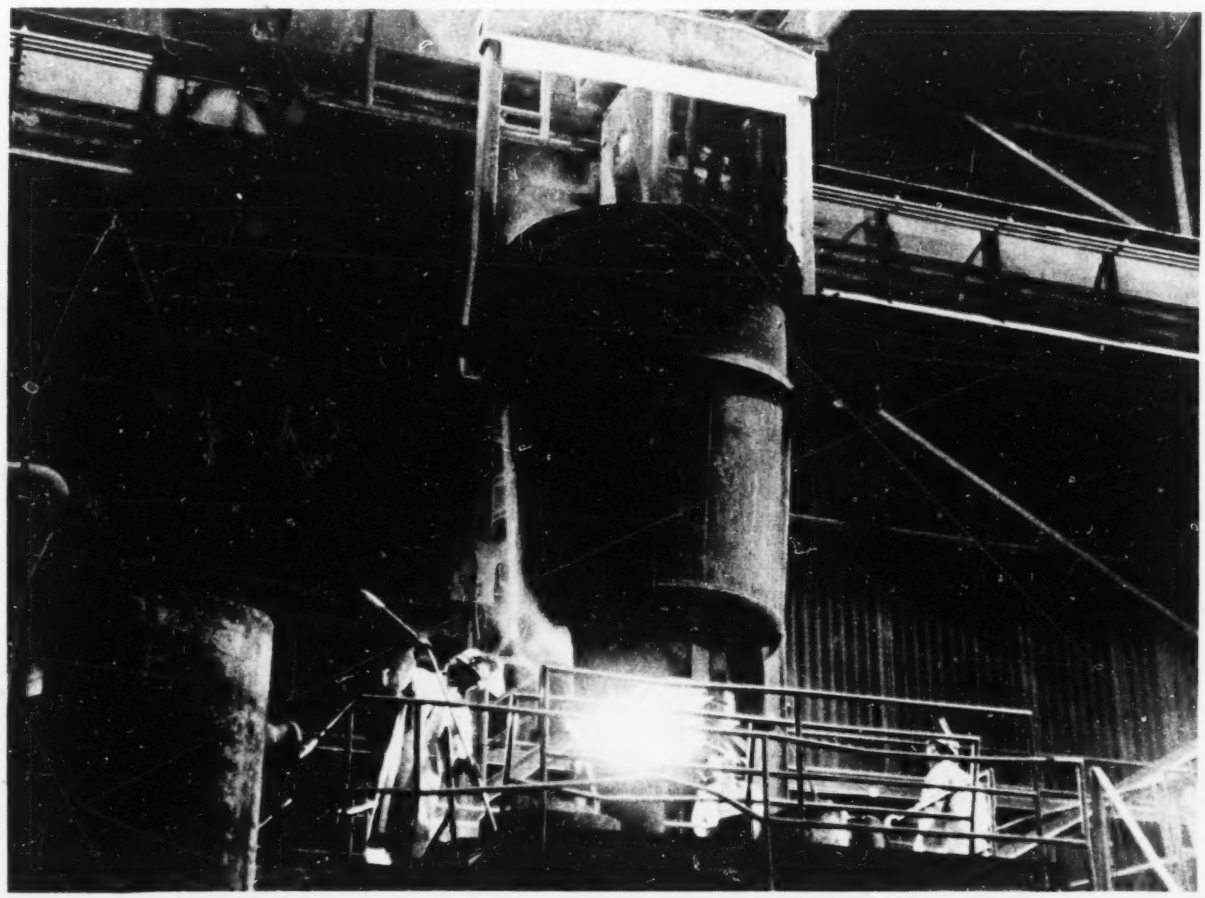
Computers

For continuous casting and a great many other operations, there are gaps in the sensor lineup. Steel producers must rely to a considerable extent on indirect quality measurements. This entails computation and computers.

"We have a computer system that gathers all the variables during the casting process," said Mr. Cartwright. "It makes the decision on whether the steel can be directly hot charged or whether we go into scarfing."

If casting speeds and other variables are on target, the slab surface should be

Steel producers have been groping for a perfect mix of a computer and physical control device.



flawless. "It never quite works out that way," grumbled one engineer.

It is true, however, that close monitoring of the casting process helps in predicting quality. "You can infer an awful lot about the quality of the slab surface from the operating parameters," said Mr. Miner.

You also can tell a lot about a BOF by analyzing off-gases and calculating carbon content. Most shops are still relying on this type of indirect measurement along with predictive models.

"You have to get the static control working properly and then take the next step into the dynamic control," said Mr. Howell of National.

At the direct control levels, minicomputers and microprocessors are finding extensive use. It's possible the popularity of the distributed system is bringing excessive computerization.

"I wonder if the driving force is vendor philosophy or user philosophy," said Charles Slusher, supervising project engineer for Armco, Inc. "A lot of the equipment is coming through imbedded with programmable controllers and microprocessors."

One vendor cautions against unnecessary complexity. "It swings both ways," said Richard J. Bowman, president, I/O Controls, Inc., Newtown, Pa.

A few years ago, the mills were extremely wary of high technology systems, said Mr. Bowman, whose company has supplied average gage systems to Bethlehem at Sparrows Point and to a number of U.S. Steel plants.

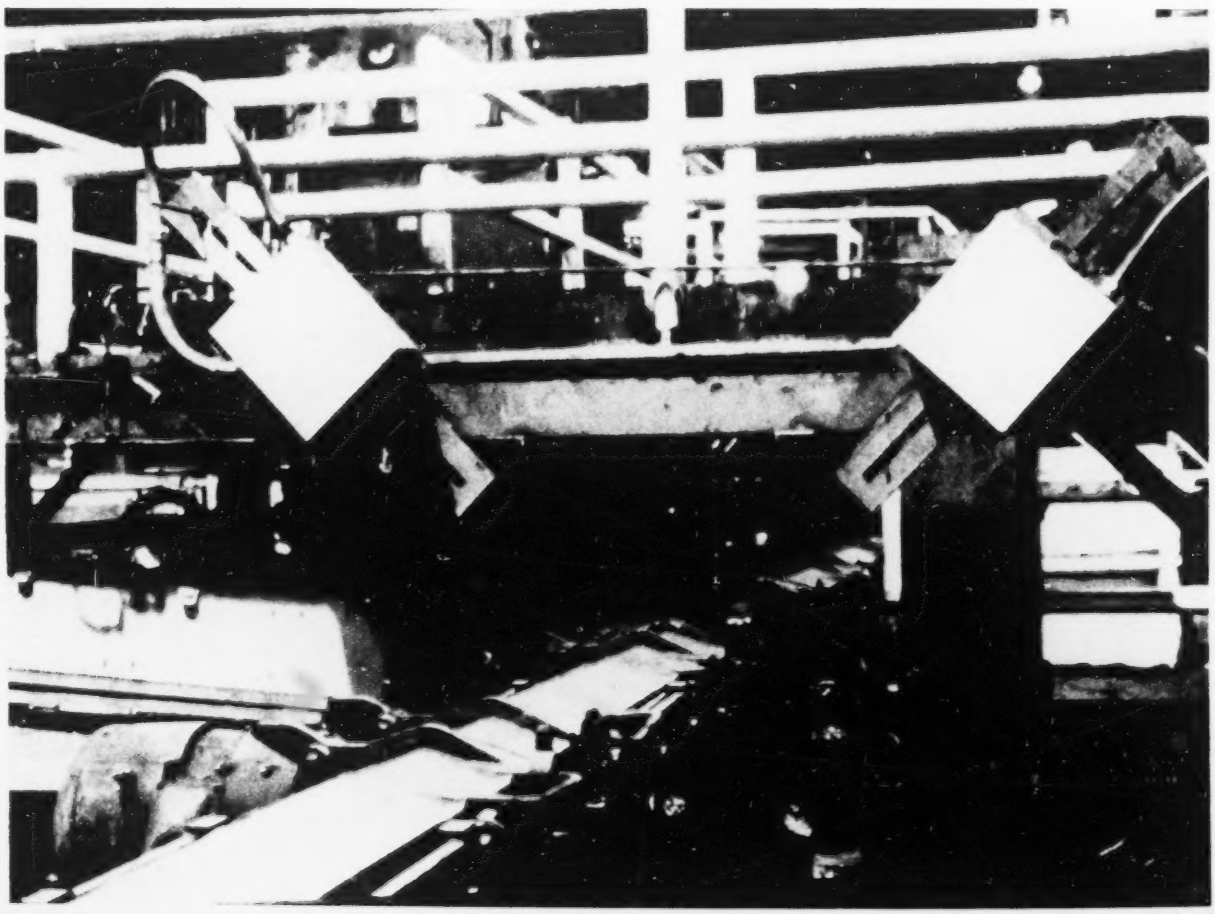
Now, he said, the mills are crying for computer systems. "They're coming after us." Mr. Bowman said operators can react in a negative way to overly elegant control systems.

"You're dealing with people who are afraid of computers," he said. This fear will often translate into poor performance, he added, while operators will respond favorably to simplicity.

Another supplier reports this view. "I tend to agree some instruments are being made too complicated," said Lawrence C. Meredith, group marketing manager for AccuRay Corp.

Mr. Meredith pointed out, however, that computerization can also simplify controls. For its 7000 gage control introduced last year, AccuRay went to a microprocessor. This made it possible to reduce the number of printed circuits from 12 to 13 to only four. There are fewer components to go wrong, said Mr. Meredith, and the microprocessor provides diagnostic information.

The main reason AccuRay went to the computer was to upgrade the sens-



Vision systems like this one from Opcon are used to measure the diameter of hot seamless steel pipe.

ing function. The microprocessor can digest signals 100 times a second. This makes it possible to have a gage that is accurate to within 1/10th pct. The previous model went down to ¼ pct.

There is no question computers are going to find increased use in controlling, synchronizing and managing steel plants. Operators could be overwhelmed with information, but one development is helping in this regard.

"We're seeing more than more graphic usage," said Mr. Slusher of Armco. "Especially color graphics because you can integrate so much more in a display."

Dr. Burk of Allegheny Ludlum speaks of a "window on the process.... Every instrument vendor, every computer company—even IBM—is now in the field selling graphic display systems to try and assimilate all this information."

There is another significant development. Some very high powered computer companies are becoming deeply involved in the hardware and software of steel process controls.

At John Lysaght in Australia, a cold rolling mill is being controlled by a computer from Hewlett Packard. Designated HP 2250, the system with all spares had a cost of $850,000. Officials of John Lysaght estimated yearly savings at $500,000.

At Contraves-Goerz in Pittsburgh, a system for measuring wall thickness of pipe is in the final stages of testing. In the same room with this unit are highly sophisticated devices for tracking satellites and missiles.

The steel instrument didn't look out of place next to the space hardware. The measurement of wall thickness is accomplished by inserting one laser depth gage into the center of the pipe and positioning another depth probe on the outside.

The probes rotate and wall thicknesses are calculated at intervals around the circumference of the pipe.

The growing involvement of suppliers is changing the role of the steel engineer. "We're now integrators," said Mr. McMahon of Allegheny Ludlum.

Dr. Pitler stresses the need for balance. "You've got to be careful you don't become so enamored of the gadgetry or the calculations that you lose sight of what you're really trying to do." □

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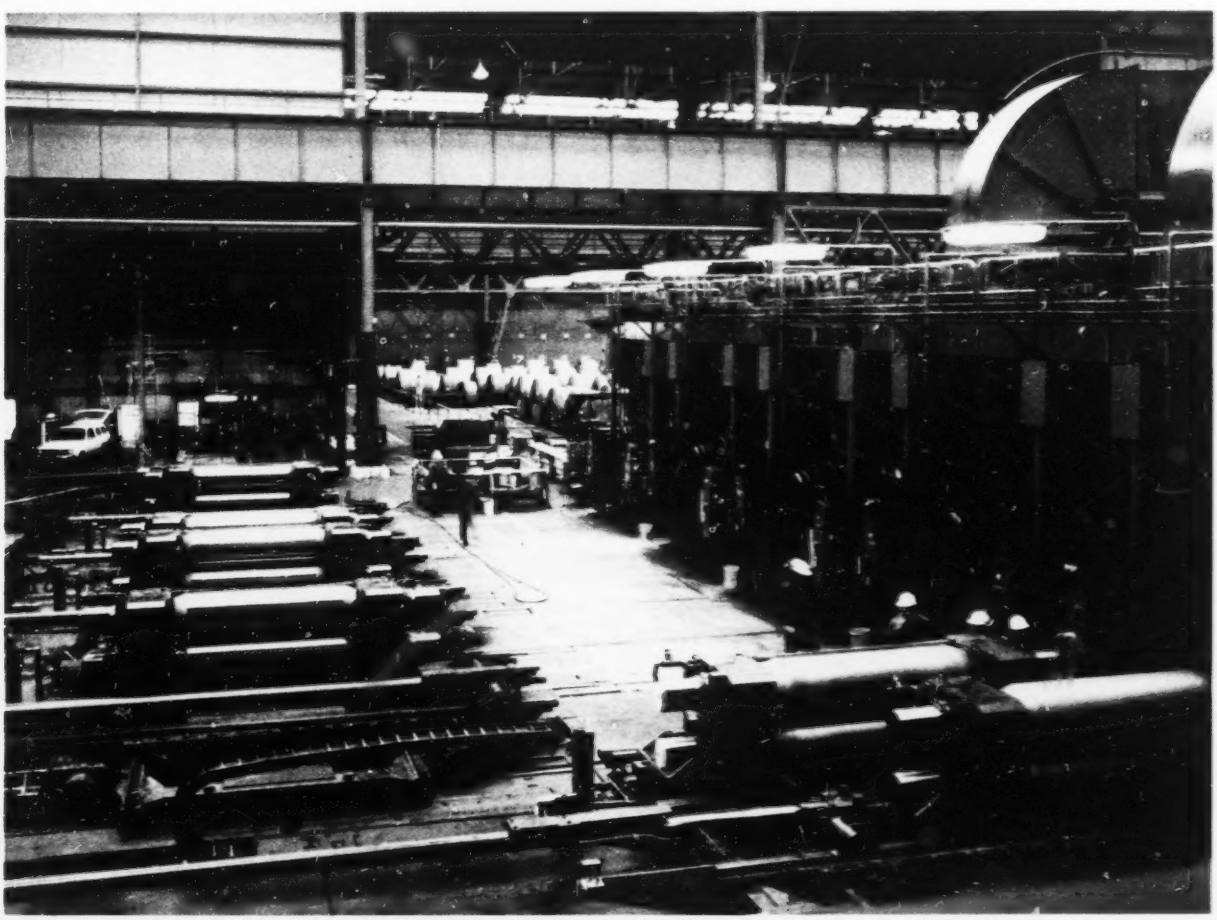

Precision cold rolling of sheet at John Lysaght in Australia is accomplished by a Hewlett Packard computer.

2nd QUARTER EARNINGS
STEEL STALLED; NONFERROUS GAINS SLIGHTLY

BY GEORGE MCMANUS & ROBERT REGAN

Steel

A cruel fate gave steel companies a small taste of prosperity in the second quarter then shoved the companies back down again.

Prosperity was in the form of profits for most of the mills. The downward shove was supplied by a 10 to 15 pct drop in shipments in the third quarter. The decline will mean profits that are skimpy or nonexistent.

Earnings weren't exactly robust in the second quarter. The combined profit of the five largest mills came to 1.6 pct of sales. Armco, Inc. and LTV Corp. continued to lose money.

However, 15 steel producers moved from red ink in the second quarter of 1983 to black ink in the second quarter of 1984.

There were some decisive upward swings. United States Steel Corp. went from a net loss of $112 million in 1983 to a profit of $140 million in 1984...The steel portion of U.S. Steel had an operating profit of $84 million in 1984. That compared with an operating loss of $130 million in the second quarter of 1983.

For Bethlehem Steel Corp., a second quarter net profit of $24 million was the first since 1981. The market slide was noted by Donald H. Trautlein, chairman of Bethlehem.

"As a result, we expect to be at about a break-even level for the third quarter," said Mr. Trautlein.

National Intergroup, Inc., made one of the stronger showings in the second quarter. National's net income of $24.6 million came to 3.1 pct of sales. The net was reduced by a non-recurring charge of $16.9 million. Without this, the sales margin would have been 5.2 pct.

Inland Steel Co. continued its profit recovery in the second quarter. The $24.6 million earned by Inland was up from a loss of $29.7 million in the second quarter of 1983.

After a rebound in the first quarter steel companies were slapped back down again. In the nonferrous sector, aluminum continued to show the way with copper and nickel still waiting for a pickup in the capital goods.

Somewhat surprising was Armco's second quarter net loss of $14.1 million. High interest charges and continued losses in the oil country business contributed to the deficit. Armco's carbon steel segment had an operating profit of $44 million for the first six months of 1984.

Armco doesn't expect its oil country business to earn money in the second half. The energy field is one of many where capital spending is still lagging.

LTV had a net loss of $22.7 million in the second quarter. Like Armco, LTV was hit by higher interest charges and by the depressed state of the oil country market.

Not included in LTV's results were the financial returns of what had been Republic Steel. Republic is now part of LTV Steel but its second quarter earnings results won't be available for a month or so.

The profit of employee-owned Weirton Steel Corp. jumped from $9.6 million in the first quarter of 1984 to $22.7 million in the second quarter. Weirton's 7.4 pct return on sales was the highest for any of the big mills.

It appears that Weirton is making good on a game plan that calls for expanded sales of cold rolled sheet. The company shipped 611,000 tons in the second quarter. That was up 6.6 pct from the first quarter.

Nonferrous

Leading nonferrous metals companies continued to trudge their way toward recovery in the second quarter of 1984. Aluminum once again had a better time of it than did producers of copper and nickel, however.

Low copper prices adversely impacted results of Asarco and Phelps Dodge Corp., both reported losses in the period, and also helped pull Newmont Mining's profits lower by 20 pct.

A sleeping capital goods sector is limiting the recovery capability of the copper and nickel industries. In nickel, Inco Ltd.'s operating results for primary metals and alloy products were in the black in the second quarter and first half, its shipments of nickel and copper were higher in the second quarter and first half and average nickel prices were higher as well. The benefits, however, extended only to cutting the second quarter loss to $15.1 million from the $37.1 million loss in the same 1983 period. And the company's nickel stocks rose to 94 million lbs from the 83 million lbs on hand at the start of the year.

Price recovery was the main contributor to sales and profit gains by North American's four largest aluminum producers. Aggregate shipments by Aluminum Co. of America, Alcan Aluminum Ltd., Reynolds Metals Co. and Kaiser Aluminum & Chemical Corp. were down 4.6 pct to 1.42 million short tons, but aggregate gross revenues were up 17.6 pct to $4.96 billion. All four operated in the black in the period just ended (Reynolds and Kaiser were in the red in the second quarter last year) and aggregate profits equaled $280.6 million compared with a negative $82.8 million in the second quarter last year.

(Cont. on p. 54)

STEEL SHOWS SOME UPWARD MOVEMENT

SECOND QUARTER PROFIT REPORT—1984 (In Millions of Dollars)

		EARNINGS			SALES		
	1984 E/S	2nd Quarter 1984	2nd Quarter 1983	Pct Change	2nd Quarter 1984	2nd Quarter 1983	Pct Change
USS	2.9	$140.00	$(112.00)	—	$4,900.00	$4,400.00	+11%
BETHLEHEM	1.6	24.00	(70.70)	—	1,505.10	1,234.60	+22%
ARMCO	—	(14.10)	(75.80)	—	1,196.00	1,079.00	+11%
NATIONAL	3.1	24.64	(99.17)	—	794.86	752.14	+5.7%
INLAND	2.6	24.65	(29.74)	—	938.95	748.12	+26%
LTV*	—	(22.70)	(61.30)	—	1,580.30	993.70	+59%
TOTAL	1.6	176.49	(448.71)	—	10,915.21	9,207.56	+19%
WHEEL-PGH	1.9	5.30	(18.89)	—	279.08	191.57	+46%
INTERLAKE	4.1	10.24	3.58	+186%	248.56	206.01	+21%
CYCLOPS	1.7	5.51	(0.45)	—	317.11	243.20	+30%
CF&I	2.5	2.21	(14.67)	—	89.86	56.93	+58%
COPPERWELD	6.9	8.54	(12.37)	—	124.42	79.98	+56%
CARPENTER	7.9	12.80	9.70	+32%	162.86	112.39	+45%
LUKENS	2.7	3.11	(3.33)	—	113.96	87.27	+31%
PHOENIX	—	(0.74)	(6.96)	—	32.64	30.20	+8.1%
FLORIDA	1.3	0.94	0.76	—	72.09	61.52	+17%
LACLEDE	3.8	2.23	1.41	+58%	59.29	45.56	+30%
NUCOR	5.4	9.2	4.8	+8.9%	169.0	127.6	+32%
EASTMET	1.8	1.26	(2.56)	—	69.03	42.60	+62%
WEIRTON	7.4	22.75	—	—	306.28	—	—
QUANEX	3.3	3.51	(0.25)	—	106.45	74.63	+43%

*Does not include Republic Steel

ALUMINUM STILL CLIMBING; NICKEL AND COPPER STILL WAITING

SECOND QUARTER PROFIT REPORT (Millions of Dollars)

( ) = Denotes Loss

	Earnings			Sales and Other Revenues		
	2nd Q 1984	2nd Q 1983	Pct Chg.	2nd Q 1984	2nd Q 1983	Pct Chg.
ALCAN	$98.0	$3.0	+3,166.7	$1,478.0	$1,329.0	+11.2
ALCOA	112.8	34.6	+226.0	1,452.3	1,257.9	+15.5
AMAX	9.8	(21.2)	—	651.4	567.8	+14.7
ASARCO	(28.6)	27.6	—	357.2	380.3	−6.1
BRUSH WELLMAN	10.7	6.3	+69.8	84.6	60.5	+39.8
CABOT CORP.	26.5	14.1	+87.9	468.3	389.0	+20.4
COMINCO	24.8	(3.7)	—	439.2	413.5	+6.2
ENGLEHARD	18.4	18.0	+2.2	606.0	617.0	−1.8
FREEPORT MCMORAN	25.9	20.9	+23.9	217.8	186.2	+17.0
INCO LTD.	(15.1)	(37.1)	+59.3	385.0	284.0	+35.6
KAISER ALUMINUM	32.5	(51.3)	—	1,017.2	781.9	+28.9
MARTIN MARIETTA	74.1	57.0	+30.0	1,176.0	953.5	+23.3
NEWMONT MINING	12.6	15.8	−20.3	203.4	186.9	+8.8
NORANDA MINES	19.4	9.2	+110.9	986.6	795.1	+24.1
OLIN CORP.	33.0	24.0	+37.5	545.3	490.3	+11.2
OREGON MET	1.0	(0.3)	—	10.4	8.9	+16.9
PHELPS DODGE	(20.7)	0.3	—	255.8	282.1	−9.3
REYNOLDS METALS	37.3	(69.1)	—	1,003.1	853.4	+17.5
VULCAN MATERIALS	25.6	15.4	+66.2	259.2	199.9	+29.7

Alcan Aluminum Ltd.: Net for the '84 period includes an $11 million tax-loss carryforward. **Amax Inc.:** Net for the '84 quarter includes tax credits of $5.6 million and a $20.7 million gain on sale of shares in oil and gas interests. **Asarco Inc.:** Net loss for the '84 period includes a pretax charge of $38 million reflecting estimated $60 million cost of closing the Tacoma, Wash. copper smelter and $22 million credit from changes to estimated costs for previous plant closings. **Cominco Ltd.:** Canadian funds. Net for the '84 period includes $5.2 million extraordinary credit gained mainly on sale of U.S. oil investment. **Martin Marietta Corp.:** Net for the '83 period includes pre-tax gain of $67 million from sale of assets. **Phelps Dodge Corp.:** Net loss for the '84 period includes extraordinary gain of $2.4 million. **Reynolds Metals Co.:** Net for the '84 period includes a $3.2 million net charge for closing Jamaican bauxite mining operations.

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PRICE & PRODUCTION DATA

(Effective August 6, 1984)

Steel production by districts, thousands of tons (000 omitted)

	Last Week	Two Weeks Ago	Month Ago	Year Ago
North East Coast	185	215	204	179
Pittsburgh	233	247	183	188
Youngstown	86	89	94	91
Lake Erie	125	109	134	105
Detroit	147	156	141	140
Chicago	437	452	450	463
Cincinnati	87	86	108	83
St. Louis	82	77	81	73
Southern	183	186	185	140
Western	71	78	85	84
U.S. Production	1,634	1,695	1,665	1,575

Source: American Iron & Steel Institute

Lake Superior Ore Prices

51.50% Fe Natural delivered lower Lake ports. Rail transportation, handling and unloading may be charged to the account of the buyer. Coarse ore 80¢ premium.

Pellets (per iron unit natural).....gross-ton 80.50-86.9*
Mesabi, regular-unscreened .....gross-ton $32.53
Mesabi, non-bessemer.....gross-ton $30.03-31.53**

*80.50¢—Pickands Mather as of 1/27/81.
86.9¢—U. S. Steel as of 3/15/82. Cleveland-Cliffs as of 2/26/82, Oglebay Norton as of 3/25/82, and Hanna Mining as of 2/26/82.
**Effective 8/1/83.

STEEL PRODUCTION, COMPOSITE PRICES

(Effective August 6, 1984)

U.S. Steel Production	Last Week	Two Weeks Ago	To Date 1984	To Date 1983
Net tons, in thousands	1,636	1,695	59,770	47,881
Capability Utilization Rate	63.4	65.7	74.5	53.4

Composite Prices	This Week	Week Ago	Month Ago	Year Ago
Finished Steel Base* (¢/lb.—eff. 7/1/84)	27.582	27.582	27.405	26.217
Pig Iron* * (Net ton=2000 lbs.)	$213.00	$213.00	$213.00	$213.00
Scrap No. 1 hvy.* * * (Gross ton=2240 lbs.)	$ 81.83	$ 81.50	$ 82.17	$ 75.17
No. 2 bundles	$ 50.83	$ 50.83	$ 50.83	$ 45.50

Scrap Comparison (Gross Ton)

No. 1 steel, Pittsburgh..	$ 86.50	$ 86.50	$ 88.50	$ 79.50
No. 1 steel, Philadelphia ..	80.50	80.50	80.50	68.50
No. 1 steel, Chicago.....	78.50	77.50	77.50	77.50
No. 1 bundles, Detroit.....	70.50	70.50	75.50	71.50
Low Phos., Youngstown ..	80.50	80.50	80.50	79.50
No. 1 mach'y cast., Pgh...	71.50	71.50	79.50	74.50
No. 1 mach'y cast., Phila .	98.50	98.50	98.50	95.50
No. 1 mach'y cast., Chi..	115.50	115.50	115.50	108.50

*Finished Steel Composite: Weighted index of steel bars, shapes, plates, wire, rails, black pipe, hot and cold rolled sheets and strips.
* *Pig Iron Composite: Based on average prices for basic and foundry pig iron at representative producing points within the U.S.
* * *Steel Scrap Composite: Average of No. 1 hvy. melting steel scrap and No. 2 bundles delivered to consumers at Pittsburgh, Philadelphia and Chicago.

NONFERROUS PRICES

(Effective August 6, 1984) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated.

Primary Metal Prices

(cents per lb.)	current price	last price	date of change
Aluminum (LME)	52.27	52.54	8/6/84
Copper (C)	63.00-64.00	62.00-64.00	8/3/84
Lead	28.00-34.00	30.00-34.00	8/1/84
Magnesium Ingot	148.00	143.00	5/25/84
Nickel (LME)	214.93	209.41	8/6/84
Titanium Sponge	555.00-585.00	555.00	4/29/82
Zinc	50.00	50.00-53.00	7/3/84

ALUMINUM: Avg. for last week & previous week. COPPER (C) = cathode. LEAD: common grade. MAGNESIUM: 99.8% pig, delivered. NICKEL: Avg. for last week & previous week. Canada. ZINC: high grade.

Antimony, American Laredo, Texas . $2.00
Beryllium-aluminum 5% Be, per lb. contained Be $230.00
Beryllium-copper, per lb. cont. Be $130.00
Beryllium 97% powder 200 ..... $178.00
Cadmium, ton lots $1.55
Calcium, ton lots, crown $3.58
Chromium, 99.8% $3.75
Cobalt, 99%, cathode $12.50
Gold per troy oz. $349.25
Indium, dollars per troy oz. $3.30
Iridium, dollars per troy oz. $500
Magnesium sticks, 10,000 lbs. $1.97
Mercury, per 76-lb. f.o.b. N.Y. .. $300-$310
Molybdenum, lb. tech. moly oxides, 20 lb. MO can $6.85
Nickel electro (PDCR) $3.29
Palladium, per troy oz. $133
Platinum, per troy oz. $338
Rhodium, per troy oz. $700
Silver ingots, per troy oz. $7.59
Vanadium $6.00
Zirconium sponge ..... $12.00-$17.00
(Per lb. unless otherwise noted)

Straits Tin Price

(U.S. cents per lb, EX-SMELTER, based on daily market in Penang in Malaysian dollars per kilo.)

July 30—564.07 Aug. 2—564.20
July 31—564.33 Aug. 3—567.50
Aug. 1—563.27

Scrap Prices
Brass Mill Scrap

(Cents per lb; over 20,000 lbs. add 1¢ per lb)

	Solids	Turning
Copper	58½	57½
Yellow brass	55	54½
Red brass	55¾	55¼
Comm. bronze	56⅜	55½
Mang. bronze	57	50
Free cutting rod ends	60	59

Custom Smelters Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	55
No. 2 copper wire	46
Light copper	37

Ingot Makers Scrap

(Cents per lb., carload lots, del. refinery)

No. 1 copper wire	51
No. 2 copper wire	42
Light copper	33
No. 1 composition	54
No. 1 comp. turnings	52
Hvy. yellow brass solids	37
Hvy. yellow brass turnings	35
Radiators	42

Aluminum

New mixed clips	38	—39
Old sheet	36	—37
Old cast	36	—37
Clean dry borings	37	—38

Dealers' Scrap

(Dealers' buying price f.o.b. New York in cents per pound)

Aluminum

Segregated clippings	36	—37
Mixed L.C. clips	34	—35
Old sheets and cast	30	—31
Borings and turnings	22	—24
Duraluminum clippings	27	—28

Copper and Brass

No. 1 copper wire	46	—47
No. 2 copper wire	38	—39
Light copper	34	—35
Radiators	33	—34
No. 1 composition	42	—43
No. 1 composition turn'gs	39	—40
Cocks and faucets	30	—31
Clean heavy yellow brass	29	—30
Brass Pipe	30	—31
New soft brass clippings	43	—44

Lead

Heavy soft lead	10	—11
Whole batteries	3	— 4
Type metal	16	—17
Electrotype	13	—14

Nickel

Nickel solids	120	—130
Nickel rod ends	120	—130
Nickel sheets, clips	120	—130
Nickel turnings	50	— 60

Zinc

New zinc clippings	18	— 19
Old diecast zinc	14	— 15

EFFECTIVE AUGUST 6, 1984

(Effective August 6, 1984) Prices obtained in trade based on representative tonnages per gross ton delivered to consumer unless otherwise stated. Prices are the opinions of *Iron Age* editors and correspondents, based on contacts with dealers, brokers, generators and users in the industry on the effective date listed above.

Ferrous Scrap Prices

Pittsburgh

No. 1 hvy. melting	$ 86.00 to	$ 87.00
No. 2 hvy. melting	76.00 to	77.00
No. 1 dealer bundles	94.00 to	95.00
No. 1 factory bundles (auto)	90.00 to	91.00
No. 2 bundles	53.00 to	54.00
No. 1 busheling	104.00 to	105.00
Machine shop turn	12.00 to	13.00
Shoveling turnings	49.00 to	50.00
Cast iron borings	48.00 to	49.00
Low phos. punchings plate	101.00 to	102.00
Heavy turnings	76.00 to	77.00
No. 1 RR hvy. melting	92.50 to	93.50
Rails 2 ft. and under	113.00 to	114.00
Scrap rails, random lgth	99.00 to	100.00
RR specialties	105.00 to	106.00
No. 1 machinery cast	71.00 to	72.00
Cupola cast	64.00 to	65.00
Heavy breakable cast	30.00 to	31.00
Stainless		
18-8 bundles and solids	550.00 to	560.00
18-8 turnings	450.00 to	460.00

Chicago

No. 1 hvy. melting	$ 78.00 to	$ 79.00
No. 2 hvy. melting	71.00 to	72.00
No. 1 dealer bundles	92.00 to	93.00
No. 1 factory bundles (auto)	87.00 to	88.00
No. 2 dealer bundles	49.00 to	50.00
No. 1 busheling	91.00 to	92.00
Shredder scrap	89.00 to	90.00
Machine shop turn	42.00 to	43.00
Mixed bor. and turn	43.00 to	44.00
Shoveling turnings	47.00 to	48.00
Cast iron borings	47.00 to	48.00
Low phos. forge crop	111.00 to	112.00
Low phos. punchings plate ¼ in. and heavier	121.00 to	122.00
Low phos. 2 ft. and under	116.00 to	117.00
No. 1 RR hvy. melting	83.00 to	84.00
Scrap rails, random lgth	82.00 to	83.00
Reroller rails	108.00 to	109.00
Rails, 2 ft. and under	115.00 to	116.00
RR couplers and knuckles	97.00 to	98.00
RR car axles	129.00 to	130.00
No. 1 machinery cast	115.00 to	116.00
Cupola cast	102.00 to	103.00
Stove plate	99.00 to	100.00
Steel car wheels	103.00 to	104.00
Stainless		
18-8 bundles and solids	490.00 to	500.00
18-8 turnings	420.00 to	430.00
430 bundles and solids	120.00 to	125.00
430 turnings	80.00 to	90.00

Philadelphia

No. 1 hvy. melting	$ 79.00 to	$ 82.00
No. 2 hvy. melting	69.00 to	72.00
No. 1 dealer bundles	93.00 to	96.00
No. 2 dealer bundles	48.00 to	51.00
No. 1 busheling	92.00 to	95.00
Shredder scrap	98.00 to	101.00
Machine shop turn	29.00 to	32.00
Mixed bor. and turn	29.00 to	32.00
Shoveling turnings	41.00 to	44.00
Low phos. 5 ft. and under	95.00 to	98.00
Low phos. 2 ft. punchings	115.00 to	118.00
Electric furnace bundles	101.00 to	104.00
RR specialties	100.00 to	103.00
Rails, 2 ft. and under	117.00 to	120.00
Cupola cast	70.00 to	73.00
Heavy breakable cast	57.00 to	60.00
No. 1 machinery cast	97.00 to	100.00

Detroit

Broker buying prices per gross ton on cars:

No. 1 hvy. melting	$ 51.00 to	$ 52.00
No. 2 hvy. melting	50.00 to	51.00
No. 1 dealer bundles	70.00 to	71.00
No. 2 bundles	35.00 to	36.00
No. 1 busheling	69.00 to	70.00
Drop forge flashings	43.00 to	44.00
Machine shop turn	45.00 to	46.00
Mixed borings and turn	23.00 to	24.00
Shoveling turnings	46.00 to	47.00
Cast iron borings	36.00 to	37.00
Heavy breakable cast	38.00 to	39.00
Mixed cupola cast	54.00 to	55.00
Automobile cast	77.00 to	78.00
Stainless		
18-8 bundles and solids	445.00 to	455.00
18-8 turnings	350.00 to	360.00
430 bundles and solids	100.00 to	110.00

Youngstown

No. 1 hvy. melting	$ 66.00 to	$ 69.00
No. 2 hvy. melting	47.00 to	50.00
No. 1 dealer bundles	79.00 to	82.00
No. 2 dealer bundles	35.00 to	38.00
Machine shop turn	13.00 to	16.00
Shoveling turnings	18.00 to	21.00
Low phos. plate	79.00 to	82.00
Electric furnace bundles	76.00 to	79.00
Galvanized bundles	67.00 to	70.00

Cleveland

No. 1 hvy. melting	$ 60.00 to	$ 63.00
No. 2 hvy. melting	37.00 to	40.00
No. 1 dealer bundles	68.00 to	71.00
No. 1 factory bundles	72.00 to	75.00
No. 2 bundles	19.00 to	22.00
No. 1 busheling	73.00 to	76.00
Machine shop turn	8.00 to	11.00
Mixed bor. and turn	8.00 to	11.00
Shoveling turnings	10.00 to	13.00
Cast iron borings	13.00 to	16.00
Cut structural & plates, 2 ft. and under	105.00 to	108.00
Low phos. punchings plate	105.00 to	108.00
Drop forge flashings	42.00 to	45.00
Foundry steel, 2 ft. & under	62.00 to	65.00
No. 1 RR hvy melting	79.00 to	82.00
Rails, 2 ft. and under	105.00 to	108.00
Rails, 18 in. and under	108.00 to	111.00
Steel axle turnings	59.00 to	62.00
Railroad cast	92.00 to	95.00
No. 1 machinery cast	102.00 to	105.00
Cupola cast	58.00 to	61.00
Stove plate	44.00 to	47.00
Stainless		
18-8 bundles	375.00 to	385.00
18-8 turnings	325.00 to	335.00
430 bundles	80.00 to	85.00

Buffalo

Broker buying prices per gross ton on cars:

No. 1 hvy. melting	$ 67.00 to	$ 68.00
No. 2 hvy. melting	56.00 to	57.00
No. 1 busheling	79.00 to	80.00
No. 1 dealer bundles	79.00 to	80.00
No. 2 bundles	37.00 to	38.00
Machine shop turn	14.00 to	15.00
Mixed bor. and turn	13.00 to	14.00
Shoveling turnings	17.00 to	18.00
Cast iron borings	22.00 to	23.00
Low phos. plate	95.00 to	96.00
Structural and plate, 2 ft. and under	96.00 to	97.00
Rails, 2 ft. and under	94.00 to	95.00
Scrap rails, random lgth	74.00 to	75.00
No. 1 machinery cast	79.00 to	80.00
No. 1 cupola cast	59.00 to	60.00

St. Louis

No. 1 hvy. melting	$ 66.00 to	$ 67.00
No. 2 hvy. melting	55.00 to	56.00
Foundry steel, 2 ft.	66.00 to	67.00
No. 1 dealer bundles	66.00 to	67.00
No. 2 bundles	54.00 to	55.00
Machine shop turn	17.00 to	18.00
Shoveling turnings	23.00 to	24.00
Cast iron borings	27.00 to	28.00
No. 1 RR hvy. melting	68.00 to	69.00
Rails, random length	70.00 to	71.00
Rails, 18 in. and under	89.00 to	90.00
RR specialties	85.00 to	86.00
Cupola cast	72.00 to	73.00
Heavy breakable cast	50.00 to	51.00
Stove plate	83.00 to	84.00
Steel car wheels	97.00 to	98.00
Rerolling rails	80.00 to	81.00
Unstripped motor blocks	56.00 to	57.00

Birmingham

No. 1 heavy melting	$ 73.00 to	$ 74.00
No. 2 heavy melting	65.00 to	67.00
No. 1 dealer bundles	73.00 to	74.00
No. 2 bundles	52.00 to	53.00
No. 1 busheling	73.00 to	74.00
Shredder scrap	93.00 to	94.00
Machine shop. turn	26.00 to	27.00
Shoveling turnings	40.00 to	41.00
Cast iron borings	40.00 to	41.00
Electric furnace bundles	64.00 to	65.00
Elec. furnace, 3 ft. & under	71.00 to	72.00
Structural and plate, 2 ft.	97.00 to	98.00
Structural and plate, 4 ft.	87.00 to	88.00
No. 1 RR hvy. melting	87.00 to	88.00
Scrap rails, random lgth	82.00 to	83.00
Rails, 2 ft. and under	102.00 to	103.00
Angles and splice bars	87.00 to	88.00
No. 1 cupola cast	84.00 to	85.00
Unstripped motor blocks	67.00 to	68.00

Cincinnati

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 59.00 to	$ 60.00
No. 2 hvy. melting	55.00 to	56.00
No. 1 dealer bundles	71.00 to	72.00
No. 2 bundles	33.00 to	34.00
Machine shop turn	5.00 to	6.00
Shoveling turnings	7.00 to	8.00
Cast iron borings	20.00 to	21.00
Low phos. 18 in. and under	88.00 to	89.00
Rails, random length	71.00 to	72.00
Rails, 2 ft. and under	87.00 to	88.00
No. 1 cupola cast	60.00 to	61.00
Heavy breakable cast	27.00 to	28.00
Drop broken cast	81.00 to	82.00

New York

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 50.00 to	$ 52.00
No. 2 hvy. melting	41.00 to	43.00
No. 2 dealer bundles	23.00 to	27.00
Mixed bor. and turn	11.00 to	13.00
Machine shop turn	6.00 to	7.00
Shoveling turnings	14.00 to	15.00
Clean cast. chem. borings	35.00 to	36.00
No. 1 machinery cast	89.00 to	90.00
Mixed yard cast	50.00 to	51.00
Heavy breakable cast	10.00 to	12.00
Stainless		
18-8 prepared solids	490.00 to	510.00
18-8 turnings	390.00 to	410.00
430 prepared solids	90.00 to	110.00
410 solids	80.00 to	90.00

Boston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 65.00 to	$ 66.00
No. 2 hvy. melting	55.00 to	56.00
No. 1 dealer bundles	70.00 to	71.00
No. 2 bundles	39.00 to	41.00
No. 1 busheling	75.00 to	76.00
Shredder scrap	73.00 to	75.00
Machine shop turn	14.00 to	16.00
Shoveling turnings	20.00 to	22.00
No. 1 machinery cast	85.00 to	90.00
Mixed cupola cast	48.00 to	50.00
Heavy breakable cast	16.00 to	17.00

San Francisco

No. 1 hvy. melting	$ 43.00 to	$ 45.00
No. 2 hvy. melting	37.00 to	39.00
No. 1 dealer bundles	33.00 to	35.00
No. 2 dealer bundles	16.00 to	18.00
Machine shop turn	6.00 to	8.00
Cast iron borings	6.00 to	8.00
No. 1 cupola cast	81.00 to	83.00

Los Angeles

No. 1 hvy. melting	$ 44.00 to	$ 46.00
No. 2 hvy. melting	37.00 to	39.00
No. 1 dealer bundles	34.00 to	36.00
No. 2 dealer bundles	16.00 to	18.00
Machine shop turn	10.00 to	12.00
Shoveling turnings	8.00 to	10.00
Cast iron borings	6.00 to	8.00
Elec. furnace, 1 ft. and under (foundry)	77.00 to	79.00
No. 1 cupola cast	75.00 to	77.00

Seattle

No. 1 hvy. melting	$ 70.00 to	$ 72.00
No. 2 hvy. melting	59.00 to	61.00
No. 2 bundles	41.00 to	43.00
No. 1 cupola cast	97.00 to	99.00
Mixed yard cast	84.00 to	86.00

Hamilton, Ont.

Brokers buying price per net ton on cars:

No. 1 heavy melting	$ 90.00
No. 2 heavy melting cut 2 ft. and under	84.00
No. 1 dealer bundles	92.00
No. 2 bundles	48.00
Mixed steel scrap	62.00
Bush. new fact. prep'd.	92.00
Bush. new fact. unprp'd.	82.00
Machine shop turn	41.00
Short steel turn	43.00
Mixed bor. and turn	30.00
Cast scrap	73.00

Houston

Brokers buying prices per gross ton on cars:

No. 1 hvy. melting	$ 73.00 to	$ 74.00
No. 2 hvy. melting	59.00 to	60.00
No. 2 bundles	42.00 to	43.00
Machine shop turn	16.00 to	17.00
Crushed turnings	34.00 to	35.00
Shredder scrap	78.00 to	79.00
Cut structural plate, 2 ft. and under	100.00 to	102.00
Cut structural plate, 5 ft. and under	87.00 to	89.00
Unstripped motor blocks	60.00 to	61.00
Cupola cast	75.00 to	76.00

DURABLE ORDERS SLIP IN JUNE

Another sign the economy is slowing occurred in June, but experts say there's no reason for alarm, yet. Overall new orders for manufactured goods fell 1.4 pct in June following a "healthy uptick" registered the previous month. The drop in the sixth month, however, was the second decline in the three month period, April-June.

Observers point out that after 18 months of recovery, statistical indicators are expected to vary, up and down, but not dramatically so. June new orders for durable goods dropped 2.4 pct to $99.8 billion compared with May's $102.3 billion, the U.S. Commerce Department said. Conversely, the constantly fluctuating defense industries segment of the orders rose 23 pct to $7.0 billion. Defense industries' orders had dropped in May.

Capital goods new orders minus the defense segment dropped 3.1 pct to $28.1 billion versus May's $29.0 billion. The May figure had risen compared with April.

In metalworking the declines in June were dramatic. Total machine tool orders dropped 66 pct to $192.2 million compared with $320 million in May. Within that category, metalforming machine tool orders dropped 117 pct, to $60.4 million versus May's $131.1 million. Metalcutting machine tool orders fell 43 pct, $131.8 million compared to May's $188.5 million.

Primary metal orders were down slightly in June, for the second month in a row. The figure was $10.6 billion in the sixth month, 0.9 pct smaller than May. This marked the sixth decline in the last seven months. Within that category, nonferrous metals dropped 2 pct to $4.9 billion compared with $5.0 billion in May. Steel orders were up, $4.5 billion versus $4.4 billion, a 2 pct rise.

The only major industry category to show improvement was industrial transportation equipment, but that was up only 0.8 pct—$24.0 billion versus $23.8 billion.

Billions of Dollars, Seasonally Adjusted Monthly Total, unless otherwise noted **Source: U.S. Dept. of Commerce**		Latest Month or Qtr.	Previous Month or Qtr.	Same Period Year Ago
CAPITAL EXPENDITURES (Annual Rates)				
U.S. Industry, Total	2nd Qtr.	$303.8	$332.7	$302.2
Manufacturing, Total	2nd Qtr.	126.0	124.7	111.3
Manufacturing, Durable Goods	2nd Qtr.	58.3	59.2	50.9
Mining Industry	2nd Qtr.	13.3	13.6	14.6
KEY INDICATORS, Durable Goods Manufacturing				
New Orders	June	99.8	102.3	89.9
Shipments	June	99.2	97.9	85.9
Inventories	June	182.3	180.6	169.6
Unfilled Orders	June	345.3	344.6	305.0
NEW ORDERS, METALWORKING				
Capital Goods Producers, Nondefense Industries	June	28.1	29.0	23.3
Capital Goods Producers, Defense Industries	June	7.0	5.7	8.3
Primary Metals, Total	June	10.6	10.7	9.8
Steel (SIC 331)	June	4.5	4.4	3.8
Iron & Steel Castings (SIC 332)	June	1.2	1.3	1.1
Nonferrous Metals	June	4.9	5.0	4.9
Nonelectrical Mach.-Equip. Industries, Total	June	18.5	18.8	14.7
Engines & Turbines	June	1.5	1.0	0.8
Farm Machinery & Equipment (Shipments)	June	0.9	0.9	0.9
Construction, Mining & Mat. Hdlg. Equip.	June	3.0	3.0	2.5
General Industrial Machinery	June	1.5	1.3	1.1
Fluid Power Equipment** (Index-1972=100)	June	300.0	304.0	249.0
Metalworking Machinery	June	0.8	1.0	0.6
Machine Tools, Total ($ Mill., Unadjusted)***	June	192.2	320.0	145.3
Machine Tools, Metalcutting***	June	131.8	188.5	96.5
Machine Tools, Metalforming***	June	60.4	131.1	48.8
Electrical Mach. & Equip. Industries, Total	June	16.1	17.5	13.7
Elec. Transmission Equip. & Ind. Apparatus	June	2.0	1.9	1.9
Household Appliances	June	1.5	1.6	1.2
Communication Equipment	June	5.7	5.6	4.8
Transportation Equip. Industrial, Total	June	24.0	23.8	23.3
Motor Vehicles & Parts (Shipments)	June	15.3	15.6	12.9
Aircraft, Missiles & Parts	June	7.2	6.4	8.4
Shipbuilding & Military Tanks	June	0.9	1.1	1.2
Fabricated Metal Products, Total	June	11.1	11.6	10.3
Instruments, Total	June	4.9	5.1	4.2

*Est.—Commerce Dept., **Source: National Fluid Power Assn., ***Source: NMTBA

NOTE

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